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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/510,629	02/22/2000	Willilam M. Hartmann	6550-000043	2872

7590 04/07/2004

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EXAMINER

GARCIA OTERO, EDUARDO

ART UNIT	PAPER NUMBER
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2123

13

DATE MAILED: 04/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/510,629

Applicant(s)

HARTMANN, WILLIAM M.

Examiner

Eduardo Garcia-Otero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION: Non-Final Action

Introduction

1. Title is: PROCESS FOR HIGH FIDELITY SOUND RECORDING AND REPRODUCTION OF MUSICAL SOUND.
2. First named inventor is: HARTMANN
3. Claims 1-22 have been submitted, examined, and rejected.
4. This action is in response to the amendment and Request for Continued Examination received 3/24/04, adding claims 21 and 22.
5. US application was filed 2/22/2000, and no earlier priority is claimed.
6. This is the first action after Request for Continued Examination, and is non-final.

Index

7. **Carver** refers to US Patent 4,309,570 (from IDS).
8. **Aronis** refers to US Patent 4,175,466.
9. **Logue** refers to US Patent 6,279,379.
10. **Sakai** refers to US Patent 6,526,849.
11. **Krauss** refers to US Patent 2,806,953.
12. **Sims** refers to US Patent 5,206,913.
13. **Tucker** refers to The Computer Science and Engineering Handbook, by Allen B. Tucker, CRC Press, ISBN: 0-8493-2909-4, 1996, pages 1557-1559, and 1354-1360.
14. **Illustrated Oxford Dictionary** refers to Illustrated Oxford Dictionary, Oxford University Press, 1998, ISBN 0-7894-3557-8, pages 270 and 667:
 - ensemble**: “a group of actors, dancers, musicians, etc., performing together...” page 270.
 - quartet**: “composition for four voices or instruments... the performers of such a piece”, at page 667.
15. **McGraw-Hill Dictionary** refers to The McGraw-Hill Dictionary of Scientific and Technical Terms, Fourth Edition, by McGraw-Hill Companies, Inc., ISBN 0-07-045270-9, 1989:
 - contact microphone**: “[ENG ACOUS] A microphone designed to pick up mechanical vibrations directly and convert them into corresponding electrical currents or voltages.”

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pickup: “A device that converts a sound, scene, measurable quantity, or other form of intelligence into a corresponding electrical signals, as in a microphone, phonograph pickup, or television camera.”

scale: “graduated series of musical tones ascending or descending in order of pitch according to a specified scheme of their intervals”.

inversion: “... [COMMUN] The process of scrambling speech for secrecy by beating the voice signal with a fixed, higher audio frequency and using only the difference frequencies”

16. **Webster** refers to Merriam-Webster’s Collegiate Dictionary, Tenth Edition, Merriam-Webster, 2000, ISBN 0-87779-708-0:

ensemble: “concerted music of two or more parts... the musicians engaged in the performance of a musical ensemble”

octave: “a musical interval embracing eight diatonic degrees... a tone or note at this interval... the harmonic combination of two tones an octave apart... the whole series of notes, tones, or digitals comprised within this interval and forming the unit of the modern scale... the interval between two frequencies (as in an electromagnetic spectrum) having a ratio of 2 to 1”.

invert: “to turn inside out or upside down”

17. **IEEE Dictionary** refers to The Authoritative Dictionary of IEEE Standards and Terms, Seventh Edition, by IEEE Press, ISBN 0-7381-2601-2, 2000.

Applicant Remarks

18. **NEW MATTER OBJECTION.** The prior new matter objection is withdrawn due to Applicant’s amendments. However, new new matter objections are made below for the instant amendments.
19. **REJECTION UNDER 35 USC 112, FIRST PARAGRAPH.** The prior 35 USC 112 first paragraph rejection of claim 16 is moot due to Applicant’s amendments. However, new rejections are made below.
20. **REJECTION UNDER 35 USC 112, SECOND PARAGRAPH.** The prior 35 USC 112 second paragraph rejection of claim 16 is moot due to Applicant’s amendments. However, new rejections are made below.

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21. 35 USC 103 REJECTIONS. Applicant asserts that the amended claims are not disclosed by the prior 35 USC 103 rejections. New 35 USC 103 rejections are made below, corresponding to the amended claims.

New Matter-objection to Amendment

22. The amendment filed 10/7/02 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. See MPEP 608.04, and 706.03(o), and 2163.03 and 2163.06 and 2163.07. Applicant is required to cancel the new matter in the reply to this Office Action. The new matter is discussed below in the written description rejection.

35 USC § 112- first paragraph-written description

23. The following is a quotation of the first paragraph of 35 U.S.C. 112: The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
24. Claim 22 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.
25. Claim 22 states “**first absorption panel... second absorption panel**”. Said panels are not adequately described in the original disclosure.

35 USC § 112-Second Paragraph-indefinite claims

26. The following is a quotation of the second paragraph of 35 U.S.C. 112: The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
27. **Claims 1-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite** for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
28. Claim 1 (currently amended) states “at least one multi-driver loudspeaker system driven by a weighted mixture of spectrally different instrument signals with **inversion capability**,

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thereby causing different high frequency harmonics to radiate in directions that change as musical notes change". The term "inversion capability" is indefinite. Specification page 12 line 14 states "Each speaker is driven by a weighted mixture of bridge and F-hole signals with possible inversion".

29. Applicant states (Remarks of 3/24/04, page 15-16) "select one or more frequency dependent decisions to invert the mixture of spectrally different signals from a signal instrument to a multi-driver speaker system in order to impart a fine structure to the instrument assigned to the multi-driver system", and states that Carver US patent 4,309,570 "demonstrates the use of the term of art (Abstract) for using interference patterns between speakers to alter the perceived radiation of sound", and states "The specification makes it clear that the inversion frequency or frequencies can be tuned by ear until the high frequency or frequency harmonics radiate in different directions as notes change such that some kind of fine structure is simulated".
30. The Examiner has carefully reviewed Carter. First, it appears that Carter uses the term "invert" in the sense of changing a positive voltage to a negative voltage (and vice versa). Carter inverts signals to obtain sound cancellation. Note column 3 line 67 "canceling sounds to eliminate cross talk", and column 4 line 22 "The delayed and inverted signal SL1 from the left subspeaker SSL is timed at a predetermined phase shift and directed at a predetermined intensity to substantially cancel the right second component R1. Thus, the cross talk from the right speaker MSR is substantially attenuated". Also see column 5 line 50 "There is a left to right compensating means adapted to receive the left stereo signal to produce an inverted and delayed left to right compensating signal". Also see FIG 4 "-180" and "RIGHT ATTENUATING SWITCH". Note that shifting a constant frequency signal by 180 degrees is identical to inversion.
31. However, Carter is using inversions to attenuate cross talk between speakers at different locations. The present claim has "one instrument assigned to one loudspeaker system" and the details and purpose of the present claimed "inversion capability" is not clear.
32. **Specifically, it is not clear how "inversion capability" causes "different high frequency harmonics to radiate in directions that change as musical notes change" per claim 1 (currently amended).**

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33. Claims 12 (currently amended) and 16 (currently amended) and 21 (new) are rejected for the same reasons.
34. All other pending claims depend from the independent claims 1, 12, 16, or 21, and thus are rejected for the same reasons.

Claim Interpretation

35. **The claim language is interpreted in light of the specification.** Limitations from the specification must not be imported into the claims, but definitions from the specification must be imported into the claims.
36. Claim 1 (currently amended) states “signal generation system for simultaneously generating contact recording signals based on vibrations”, and Claim 5 states “contact transducer”. These terms are interpreted as “contact microphones”, which are defined by the McGraw-Hill Dictionary as “[ENG ACOUS] A microphone designed to pick up mechanical vibrations directly and convert them into corresponding electrical currents or voltages.”
37. Also, “microphone” by itself is interpreted as an ordinary audio (sound-waves-in-air type) microphone, in contrast to “contact microphone”.
38. Claim 1 (currently amended) states “a plurality of multi-driver loudspeaker systems”. The term “multi-driver” is interpreted as multiple speakers. Note specification page 12 line 13 states “For each instrument of a stringed quartet, multiple loudspeakers can be used”.
39. Claim 10 states “plurality of loudspeaker systems, each loudspeaker speaker having a corresponding instrument”. Each “loudspeaker system” is interpreted as at least one speaker, and associated electronics. Also, “having a corresponding instrument” is interpreted as each “loudspeaker system produces the sounds representing a single corresponding instrument”, and is interpreted as equivalent to the amended claim 1 term “plurality of loudspeaker systems have assigned instruments, with one instrument assigned to one loudspeaker system”.

35 USC § 103

40. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been

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obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

41. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows: Determining the scope and contents of the prior art. Ascertaining the differences between the prior art and the claims at issue. Resolving the level of ordinary skill in the pertinent art. Considering objective evidence present in the application indicating obviousness or nonobviousness.
42. **Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable.**
43. Claim 1 (currently amended) is rejected under 35 U.S.C. 103(a) as being unpatentable over Carver in view of Aronis and Illustrated Oxford Dictionary and Tucker.
44. Claim 1 (currently amended) is an independent "system" claim with 5 limitations, labeled A-E for convenience by the Examiner.
45. **C-signal processing system for channelizing the contact recording signals and generating final signals based on the channelized contact recording signals** is disclosed by Carver at abstract "sound recording having right and left information channels... left compensating component... right compensating component".
46. **D-reproduction system for generating audible sound waves based on the final instrument signals** is disclosed by Carver at FIG 4 "stereo player".
47. Carver does not explicitly disclose the remaining limitations.
48. **A-signal generation system for simultaneously generating contact recording signals based on vibrations [from an ensemble]** is disclosed by Aronis at Column 10 lines 1-20 "couple a suitable contact pick-up device to the sounding board... contact microphone, generates suitable electrical signals corresponding to the sounds... individual pick-ups associated with the strings."
49. **B-an ensemble** is disclosed by Illustrated Oxford Dictionary at page 270, which defines ensemble as "a group of actors, dancers, musicians, etc., performing together..."
50. **E-a plurality of multi-driver loudspeaker systems have assigned instruments, with one instrument assigned to one loudspeaker system, and the sound waves simulate the ensemble sound pattern...** is disclosed by Tucker at page 1354 "virtual reality as the use of

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computer systems and interfaces to create the effect of an interactive three-dimensional environment, called the virtual environment, which contains objects which have spatial presence.” and page 1355 “virtual reality effect... sound”, and page 1359 “three-dimensional spatially localized sound display... various techniques to render sound whose source has a perceived location in a three-dimensional space... The simplest method... an array of speakers. A particular sound source is given a perceived spatial location by appropriately balancing the volume of that sound from each speaker...” Thus, Tucker can generate the appearance of sound from locations that do not match the physical location of the speakers.

51. Note that positioning a speaker at the same location as each corresponding instrument the simplest case of Tucker’s “simplest method... array of speakers”. In this simplest case, there is no need for balancing volumes from various speakers in order to yield a perceived spatial location. In this simplest case, the perceived spatial location is identical to the actual location of the speaker.
52. Simplifying even further, consider the case of a standard consumer stereo system playing music. The stereo recording has two channels of data, and one channel is played through the left speaker, and the second channel is played through the right speaker. For simple music consisting of 2 sources of sound (2 instruments, or 2 singers, or 1 singer and one instrument) it is common to separate the sources into distinct channels.
53. The absolute simplest case is a single source of music played through a single speaker.
54. Tucker discloses a complex system for balancing volumes from speakers in order to yield a perceived spatial location which may not match the location of any single speaker. Thus, Tucker inherently discloses the simplest case, which is when the desired perceived spatial location matches the location of a specific speaker, and thus the volume of all other speakers at other locations is zero with respect to sounds from the perceived spatial location.
55. Note that it is common practice to combine multiple drivers in a single “speaker” box (or loudspeaker system), wherein large diameter drivers produce low frequency sounds (bass) and small drivers produce high frequency sounds (treble).
56. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Aronis and Illustrated Oxford Dictionary and Tucker to modify Carver. One of ordinary skill in the art would have been motivated to do this in order to obtain clear and

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individual signals using contact microphones from musicians playing simultaneously in an ensemble, and then to reproduce the ensemble using Tucker's three-dimensional audio virtual reality.

57. Claims 2-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carver in view of Aronis and Illustrated Oxford Dictionary and Tucker and Logue and Routine Expedient (MPEP § 2144.04(VI)(C), rearrangement of parts) and Applicant's admission and Sakai.
58. Claims 2-9 depend from independent claim 1 (currently amended), with the following additional limitations.
59. In Claim 2, the limitation "**ensemble includes a plurality of instruments**" is disclosed by Illustrated Oxford Dictionary at page 270, which defines ensemble as "a group of actors, dancers, musicians, etc., performing together..." Similarly, note that Webster defines ensemble as "concerted music of two or more parts... the musicians engaged in the performance of a musical ensemble".
60. In claim 3, the limitation "**plurality of instruments includes a string quartet**" is disclosed by Illustrated Oxford Dictionary at page 270, which defines ensemble as "a group of actors, dancers, musicians, etc., performing together..." Note that Illustrated Oxford Dictionary at page 667 defines quartet as "composition for four voices or instruments... the performers of such a piece". Thus, string quartets are a subset of ensembles.
61. In claim 4, the limitation "**plurality of contact recording configurations**" is disclosed by Aronis "suitable contact pick-up device to the sounding board" and "individual pick-ups associated with the strings".
62. In claim 5, the limitation "**location governed by a cross-correlation function as measured in different frequency bands**" is disclosed by Logue at abstract "cross correlation function".
63. In claim 6, limitations "**first transducer located below an f-hole**" and "**second contact transducer located under a bridge**" are both disclosed by Routine Expedient (MPEP § 2144.04(VI)(C), rearrangement of parts). *In re Japikse*, 181 F.2d 1019, 86 USPQ 70, 73 (CCPA 1950) states "no invention in shifting the starting switch disclosed by Cannon to a different position since the operation of the device would not thereby be modified", and *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) states "the particular placement provided no

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novel or unexpected result". See also MPEP § 2144.04(VI)(C). In this claim, changing the location of the transducers (contact microphones) does not modify the operation, does not provide novel results, and does not provide unexpected results. Each contact microphone will directly measure the vibrations of the portion of the musical instrument to which it is mounted.

64. In claim 7, the limitation "**a storage system**" is disclosed by Carver at Column 1 line 40 "sound recording", and the limitation "**a retrieval system**" is disclosed by Carver at Column 1 line 50 "recording is played".
65. In claim 8, the limitations "**analog to digital conversion system**" and "**storage medium**" are both disclosed by Tucker page 1557 "Any sounds can be digitized: music... The input analog signal is sampled at a regular rate and stored. Sampling frequencies vary from 11 to 48 KHz".
66. In claim 9, the limitation "**equalization system**" is disclosed by Aronis at Column 10 line 17 "The electrical signals then can be amplified, modulated, processed and otherwise utilized".
67. Also in claim 9, "**mixing system**" is disclosed by Aronis at Column 10 line 17 "The electrical signals then can be amplified, modulated, processed and otherwise utilized".
68. Also in claim 9, "**digital to analog conversion system**" is inherently disclosed by Tucker page 1557 "Any sounds can be digitized: music... The input analog signal is sampled at a regular rate and stored. Sampling frequencies vary from 11 to 48 KHz". Note that digitizing a sound inherently discloses the reverse process: un-digitizing the sound into an analog output signal to a speaker.
69. Also in claim 9, "**amplifier**" is disclosed by Aronis at Column 10 line 17 "The electrical signals then can be amplified, modulated, processed and otherwise utilized".
70. In claim 10, "**each loudspeaker system having a corresponding instrument**" is interpreted as equivalent to the amended claim 1 term "plurality of loudspeaker systems have assigned instruments, with one instrument assigned to one loudspeaker system". Thus, this is not an additional limitation, and has already been discussed above in claim 1 (currently amended).
71. Also in claim 10, "**generating audible sound waves which approximate a frequency dependence of radiation from front, back and side surfaces of the assigned instrument**"

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is disclosed by Applicant's Admission at specification page 10 line 17 "well-known theories for the radiation of a piston in an infinite baffle, a polar pattern".

72. Also in claim 10, "**a means for simulating musician absorption of the audible sound waves**" is disclosed by Sakai Column 2 line 17 "sound absorber simulates a human being".
73. In claim 11, "**front driver having a predetermined front piston diameter**" is disclosed by Applicant's Admission at specification page 10 line 17 "well-known theories for the radiation of a piston in an infinite baffle, a polar pattern".
74. Also in claim 11, "**back driver having a predetermined rear piston diameter**" is disclosed by Applicant's Admission at specification page 10 line 17 "well-known theories for the radiation of a piston in an infinite baffle, a polar pattern".
75. MOTIVATION FOR DEPENDENT CLAIMS 2-11. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to use Aronis and Illustrated Oxford Dictionary and Tucker and Logue and Routine Expedient (MPEP § 2144.04(VI)(C), rearrangement of parts) and Applicant's admission and Sakai to modify Carver. One of ordinary skill in the art would have been motivated to do this in order to clearly record and the three-dimensional aspects of each of multiple instruments, and to digitally process (store, convert, equalize, mix, amplify) these audio signals using well known digital techniques, and then to use these digitally processed signals to inexpensively and accurately reproduce the ensemble using Tucker's three-dimensional audio virtual reality. Additionally, Tucker's audio virtual reality is more realistic by using speakers that match the frequency spatial radiation profiles of the instruments, and by simulating the sound absorption of human beings that were playing the instruments.
76. Claim 12 (currently amended) is rejected under 35 U.S.C. 103(a) as being unpatentable over Carver in view of Aronis and Illustrated Oxford Dictionary and Tucker.
77. Claim 12 (currently amended) is an independent "method" claim with 5 limitations.
78. Claim 12 (currently amended) "method" limitations are analogous to the Claim 1 (currently amended) "system" limitations, and thus is rejected for the same reasons.
79. Similarly, Claim 13 is analogous to Claim 2, and is rejected for the same reasons as Claim 2.
80. Similarly, Claim 14 is analogous to Claim 3, and is rejected for the same reasons as Claim 3.
81. Similarly, Claim 15 is analogous to Claim 5, and is rejected for the same reasons as Claim 5.

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82. Claim 16 (currently amended) is rejected under 35 U.S.C. 103(a) as being unpatentable over Sims in view of Tucker and Applicant's Admission and Illustrated Oxford Dictionary.
83. Claim 16 (currently amended) is an independent "method" claim with 6 limitations, labeled A-F by the Examiner.
84. **A-matching a system overall frequency response to a known overall frequency response** is disclosed by Sims Column 1 lines 19-38 "system frequency response... audio frequency equalization".
85. **B-matching a system coarse asymmetrical frequency response to a known coarse asymmetrical frequency response** is disclosed by Sims Column 1 lines 19-38 "system frequency response... audio frequency equalization".
86. **F-approximating a system fine asymmetrical frequency response to a known fine asymmetrical response by selecting a weight for giving a mixture of instrument signals having different spectral qualities to the loudspeaker system** is disclosed by Sims Column 1 lines 19-38 "system frequency response... audio frequency equalization".
87. Sims does not expressly disclose the additional limitations.
88. **C-employing a plurality of loudspeaker systems assigned to instruments, with one instrument assigned to one loudspeaker system** is disclosed by Tucker at page 1354 "virtual reality as the use of computer systems and interfaces to create the effect of an interactive three-dimensional environment, called the virtual environment, which contains objects which have spatial presence." and page 1355 "virtual reality effect... sound", and page 1359 "three-dimensional spatially localized sound display... various techniques to render sound whose source has a perceived location in a three-dimensional space... The simplest method... an array of speakers. A particular sound source is given a perceived spatial location by appropriately balancing the volume of that sound from each speaker..." Thus, Tucker can generate the appearance of sound from locations that do not match the physical location of the speakers.
89. Note that positioning a speaker at the same location as each corresponding instrument the simplest case of Tucker's "simplest method... array of speakers". In this simplest case, there is no need for balancing volumes from various speakers in order to yield a perceived spatial

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location. In this simplest case, the perceived spatial location is identical to the actual location of the speaker.

90. Simplifying even further, consider the case of a standard consumer stereo system playing music. The stereo recording has two channels of data, and one channel is played through the left speaker, and the second channel is played through the right speaker. For simple music consisting of 2 sources of sound (2 instruments, or 2 singers, or 1 singer and one instrument) it is common to separate the sources into distinct channels.
91. The absolute simplest case is a single source of music played through a single speaker.
92. Tucker discloses a complex system for balancing volumes from speakers in order to yield a perceived spatial location which may not match the location of any single speaker. Thus, Tucker inherently discloses the simplest case, which is when the desired perceived spatial location matches the location of a specific speaker, and thus the volume of all other speakers at other locations is zero with respect to sounds from the perceived spatial location.
93. **D-using separate loudspeaker drivers in the loudspeaker system** is disclosed by Tucker at page 1354 “virtual reality as the use of computer systems and interfaces to create the effect of an interactive three-dimensional environment, called the virtual environment, which contains objects which have spatial presence.” and page 1355 “virtual reality effect... sound”, and page 1369 “three-dimensional spatially localized sound display... various techniques to render sound whose source has a perceived location in a three-dimensional space... The simplest method... an array of speakers. A particular sound source is given a perceived spatial location by appropriately balancing the volume of that sound from each speaker...” Note that each speaker in Tucker inherently has separate drivers in order to balance the volume.
94. **E-selecting loudspeaker piston diameters appropriate to an angular dependence of the instrument assigned to the loudspeaker system** is disclosed by Applicant’s Admission at specification page 10 line 17 “well-known theories for the radiation of a piston in an infinite baffle, a polar pattern”.
95. **G-selecting a frequency-dependent decision to invert the mixture, such that the system overall frequency response, the system coarse asymmetrical frequency response and system fine asymmetrical frequency response approximate a frequency response of an**

audible ensemble sound pattern produced by an ensemble is disclosed by Aronis at Column 10 line 17 “The electrical signals then can be amplified, modulated, processed and otherwise utilized”.

96. **H-an ensemble** is disclosed by Illustrated Oxford Dictionary at page 270, which defines ensemble as “a group of actors, dancers, musicians, etc., performing together...” Similarly, note that Webster defines ensemble as “concerted music of two or more parts... the musicians engaged in the performance of a musical ensemble”.
97. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Tucker and Applicant’s Admission and Illustrated Oxford Dictionary to modify Sims. One of ordinary skill in the art would have been motivated to do this in order improve the “acoustic match” of the reproduced ensemble music according to Sims Column 1 line 23 by using Aronis mixing techniques and Applicant’s Admission to closely replicate the frequency spatial radiation of the original instruments, and to use Tucker’s array of speakers with the simplest case of locating a speaker (or loudspeaker system) at the desired location of the virtual instrument. By locating the speaker at the desired location of the virtual instrument, the virtual reality closely matches the actual ensemble without additional need for signal processing with respect to volume, phase, and sound distortion.
98. Claims 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sims in view of Tucker and Applicant’s Admission and Illustrated Oxford Dictionary and Krauss and Aronis.
99. Claims 17-20 depend from the independent claim 16 (currently amended). Please note that claims 17-19 are currently amended, although the specification incorrectly labels them with the parenthetical “(original)” at Remarks pages 8.
100. In claim 17 (currently amended):
101. A-“**selecting an instrument from the ensemble**” is disclosed by Krauss Column 1 “Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones”. Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency.
102. B-“**playing scales on the instrument**” is disclosed by Krauss Column 1 “Electrical instruments are in common use both for generating musical tones and for providing standard

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frequencies for tuning musical instruments... plurality of musical tones". Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency.

103. C- **"simultaneously generating a contact recording and a microphone recording based on a sound pattern generated by playing of the instrumen"** is disclosed by Aronis at Column 10 lines 1-20 "couple a suitable contact pick-up device to the sounding board... contact microphone, generates suitable electrical signals corresponding to the sounds... individual pick-ups associated with the strings." Note, "microphone" is interpreted as a simple audio microphone, in contrast to a contact microphone.

104. D- **"comparing the spectral characteristics of the contact recording and the microphone recording"** is disclosed by Krauss Column 1 "Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones". Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency. Note, "microphone" in Krauss is interpreted as a simple audio microphone, in contrast to a contact microphone.

105. In claim 18 (currently amended):

106. A- **selecting an instrument from the ensemble** is disclosed by Krauss Column 1 "Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones". Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency.

107. B- **playing scales on the instrument** is disclosed by Krauss Column 1 "Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones". Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency.

108. C- **generating a contact recording based on a sound pattern generated by playing of the instrument** is disclosed by Aronis at Column 10 lines 1-20 "couple a suitable contact pick-up device to the sounding board... contact microphone, generates suitable electrical

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signals corresponding to the sounds... individual pick-ups associated with the strings.” Note, “microphone” is interpreted as a simple audio microphone, in contrast to a contact microphone.

109. **D-comparing the spectral characteristics of the contact recording with a predetermined reference spectrum** is disclosed by Krauss Column 1 “Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones”. Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency. Note, “microphone” is interpreted as a simple audio microphone, in contrast to a contact microphone.
110. In claim 19 (currently amended):
111. **A-selecting an instrument from the ensemble** is disclosed by Krauss Column 1 “Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones”. Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency.
112. **B-playing scales on the instrument** is disclosed by Krauss Column 1 “Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of musical tones”. Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency.
113. **C- generating a contact recording based on a sound pattern generated by playing of the instrument** is disclosed by Aronis at Column 10 lines 1-20 “couple a suitable contact pick-up device to the sounding board... contact microphone, generates suitable electrical signals corresponding to the sounds... individual pick-ups associated with the strings.” Note, “microphone” is interpreted as a simple audio microphone, in contrast to a contact microphone.
114. **D-manually adjusting spectral characteristics of the contact recording** is disclosed by Krauss Column 1 “Electrical instruments are in common use both for generating musical tones and for providing standard frequencies for tuning musical instruments... plurality of

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musical tones”. Note that tuning a musical instrument requires selecting an instrument, playing the scales and tuning the instrument to generate the proper frequency. Note, “microphone” is interpreted as a simple audio microphone, in contrast to a contact microphone.

115. In claim 20, “**the ensemble is a string quartet**” is disclosed by Illustrated Oxford Dictionary at page 270, which defines ensemble as “a group of actors, dancers, musicians, etc., performing together...” Note that Illustrated Oxford Dictionary at page 667 defines quartet as “composition for four voices or instruments... the performers of such a piece”. Thus, string quartets are a subset of ensembles.

116. MOTIVATION FOR DEPENDENT CLAIMS 17-20.

117. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Tucker and Applicant’s Admission and Illustrated Oxford Dictionary and Krauss and Aronis to modify Sims. One of ordinary skill in the art would have been motivated to do this in order improve the “acoustic match” of the reproduced ensemble music according to Sims Column 1 line 23. Further, one of ordinary skill in the art would have been motivated to use standard musical scales to compare the spectral characteristics of the contact microphones to the microphone in order to analyze the functional relationship between the contact microphone signal and the microphone. Additionally, one of ordinary skill in the art would be motivated to digitally record and digitally modify the ensemble music because of the inherent price speed and accuracy advantages of digital storage and manipulation. Further, one of ordinary skill in the art would be motivated to using multiple recording devices to record the frequency spatial radiation of the original instruments so that Tucker’s virtual reality array of speakers could accurately simulate the original instruments, including location and frequency spatial radiation.

Conclusions

118. All claims stand rejected.

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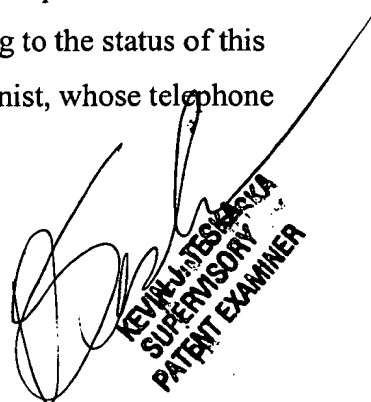
Patentable material in claim 21 (new)

119. At present, the Examiner believes that this application contains some potentially patentable material. Specifically, Claim 21 (new) is rejected only under 35 USC 112 due to the term “inversion capability” in the third limitation.
120. Specifically, the use of two multi-driver speaker systems, where each multi-driver speaker system simulates the frequency and polar radiation pattern emanating from a single musical instrument appears potentially allowable. Although none of the individual limitations is novel, the combination appears non-obvious.
121. The Examiner suggests that the first limitation term “wherein varying piston diameters are selected based on varying surfaces of the first assigned instrument” should be amended to state “wherein the front piston diameter and the rear piston diameter are chosen to respectively reproduce the forward and rear frequency dependence and polar radiation pattern of the first assigned instrument”. Note that specification page 10 states “the frequency dependence of the radiation from front and back surfaces is approximated by using separate loudspeaker drivers... polar radiation pattern”.
122. The Examiner suggests that the second limitation be amended similarly regarding the second assigned instrument.
123. The Examiner suggests that the third limitation be deleted in order to overcome the 35 USC 112 rejection.

Communication

124. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Tuesday through Friday from 9:00 AM to 8:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner’s supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone number for this group is 703-872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

* * * *


KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER